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An elastic ring of radius a is placed gently on a smooth paraboloid of revolution, whose axis is vertical; find, by use of the principle of energy, the lowest position to which the ring will descend, and its position of static equilibrium. [*R. D. Bohannon.*]

NOTES.

3

Mr. Joseph B. Mott, of Worthington, Minn., sends, in connexion with an invalid deduction of the logarithmic series, several ingenious combinations for the computation of logarithms of primes. We note the following: —

$$\log 11 = 1 + \frac{1}{2}\log 2 - 2\log 3 + \log 7 + M\left\{\frac{1}{19601} + \frac{1}{3}\cdot\frac{1}{19601^3} + \frac{1}{5}\cdot\frac{1}{19601^5} + \ldots\right\}.$$

$$\log 13 = \frac{3}{2}\log 2 + \frac{3}{2}\log 11 - \log 3 - \frac{1}{2}\log 7 - M\left\{\frac{1}{21295} + \frac{1}{3}\cdot\frac{1}{21295^3} + \frac{1}{5}\cdot\frac{1}{21295^5} + \ldots\right\}.$$

Like results are given for log 17 and log 19; and the logarithms of these and other primes are computed with considerable facility to thirty-two places.

4

Perhaps no modern geometer has fallen upon an easier and more rapid process for such computations than that indicated by Newton (*Epistola posterior ad Oldenburgium*, Oct. 24, 1676; Opuscula 1, 328). Newton computes for $x = 0{,}1$; 0,2; 0,01; 0,02; 0,001; 0,002 the values of

$$\log\sqrt{\frac{1+x}{1-x}} = x + \frac{1}{3}x^3 + \frac{1}{5}x^5 + \ldots,$$

$$\log\sqrt{\frac{1}{1-x^2}} = x^2 + \frac{1}{4}x^4 + \frac{1}{6}x^6 + \ldots;$$

whence by the aid of the simple interpolation formula

$$\log n = \log(n-x) + d\left(1 + \frac{x}{2n} + \frac{x^3}{12n^3} + \ldots\right),$$

where

$$d = \log(n + x) - \log(n - x),$$

are rapidly calculated the logarithms of the integers 80–90, 980–990, 9980–9990. These give the logarithms of all primes up to 100.

As editorial comment on such diversions we may be permitted to quote Newton's confession: "Pudet dicere," he says, "ad quot figurarum loca has computationes otiosus eo tempore produxi. Nam tunc sane nimis delectabar inventis hisce."

5

THE equation of a conic may always be written in the form $\alpha\gamma = k\beta^2$, where $\alpha = 0$, $\gamma = 0$ represent the equations of any two tangents of the curve, and $\beta = 0$ the equation of their chord of contact. If for α, γ we take the asymptotes, β will be the right line at infinity; i. e. reduces to a constant. Passing to Cartesian co-ordinates and taking as axis of x one of the bisectors of the angles between the asymptotes, we shall have $\alpha = y - ax - b$, $\gamma = y + ax + b$, and hence the equation of the conic

$$y^2 - (ax + b)^2 = c, \text{ or } y^2 = a^2x^2 + 2abx + b'^2,$$

which is Prof. Nicholson's form.* This derivation shows that, geometrically, Prof. Nicholson's criterion for the discrimination of the three species of conics is simply the reality or non-reality of the asymptotes, as was to be expected.

[*Alexander Ziwet.*]

6

THERE are in mathematics not a few formulæ which bear the names of others than those who first actually or virtually discovered them. Well known examples are Maclaurin's theorem, Cardan's rule, Demoivre's theorem. In 1879 Prof. E. Schering of Göttingen added Lagrange's interpolation-formula to this list. This formula is due to Waring, who gave it in a paper on "Problems concerning Interpolations," read before the Royal Society of London, Jan. 9th, 1779. In the works of Lagrange, edited by Serret, there are given (Vol. VII. p. 285) the lectures on elementary mathematics which Lagrange delivered in Paris in 1795, and in which the interpolation-formula occurs. Serret remarks (Vol. VII. p. 183) that these Lectures were prepared during 1794–95, and that seventeen years later (1812), upon the recommendation of Lagrange, they were reprinted in the *Journal de l'École Polytechnique*, Vol. II. p. 417.

I do not know that any English or American mathematical journal has called attention to this matter. It is but right to give Waring all honor that is due him. [*R. D. Bohannan.*]

*See *Annals of Mathematics* for May, 1884.